Bandolier 144

Independent evidence-based thinking about health care

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Most of us spend most of our time dealing with individual interventions and conditions. We get right into the details of healthcare, seeing the trees in exquisite detail, but missthe broad sweep of the wood.

One example of woods so often overlooked is adherence to therapy, because many of us just do not take our medicines or follow good advice. Another broad sweep is the whole issue of how we as patients understand information given to us because of problems with numbers and words. Perhaps the two broad sweeps are linked.

Much of this Bandolier looks at risk communication. It does not have a wealth of evidence, nor is much of the evidence we have easy to use. There are no simple solutions, but there may be beginnings. Bandolier looks at evidence that patients, and some professionals, do not understand numbers. It also presents several ways of expressing risks, taken from a powerful new book on the subject that has taken our fancy. Bandolier has also created a new section on its website on risk, chance, and probability, dedicated to Dr Richard Price (1723-1791).

How good are we with numbers

Bandolier 103 featured a study that looked at literacy attainments in rheumatoid arthritis patients. Literacy is especially important because these patients often have complicated medication regimens. The study found that one patient in six would, at best, struggle with patient education material, and one in 20 could not read prescription labels. We now have some studies looking at numeracy, both in medical students and patients.

But first we need to have some understanding of what is numeracy. The dictionary definition is one of competence in mathematical skills to allow us to cope with everyday life, but also includes understanding mathematical terms from graphs, charts, or tables. Fortunately health numeracy has been provided with a set of definitions [1].

Various levels of health numeracy have been defined (Table 1). The four levels start at the most basic, with statistical numeracy being that degree of numeracy that we would expect from most doctors, and quite a lot of other health professionals.

Numeracy in medical students

One way of measuring numeracy is to ask a few simple maths questions, and see how many correct answers you get. It does not need to be an intensive examination, and one set of questions used in studies of medical students and patients is shown in Table 2 [2]. Most of us would expect

Table 1: Some definitions of health numeracy

Concept	Definition
Health numeracy	The degree to which individuals have the capacity to access, process, interpret, communicate, and act on numerical, quantitative, graphical, biostatistical, and probabilistic health information needed to make effective health decisions
Basic numeracy	Having sufficient skills to identify numbers, and to make sense of quantitative data requiring no manipulation of numbers. An example would be identifying the correct number of pills to be taken, data and time of appointments, using a phone book
Computational numeracy	The ability to count, quantify, compute, and otherwise use simple manipulation of numbers, quantities, items, or visual elements in a health context so as to function in everyday situations. An example would be using nutritional labels correctly
Analytical numeracy	This involves the ability to make sense of information, as well as higher functions like inference, estimation, proportions, percentages, frequencies, and equivalent situations. Information may be from multiple sources, and an example would be determining whether an analytical result was within the normal range, or understanding graphs
Statistical numeracy	An understanding of basic biostatistics involving probability statements, skills to compare different scales (probability, proportion, percent), to critically analyse quantitative information like life expectancy or risk, and understanding concepts like randomisation and blinding. An example would be making choices between treatments based on standard outcomes of relative or absolute risk

Table 2: Three simple questions to test numeracy

Question	Calculation	Correct answer
Imagine that we flip a coin 1000 times. What is your best guess about how many times the coin would come up heads?	1000 x 0.5	500
In the lottery, the chance of winning a prize is 1%. What is your best guess about how many people would win a prize if 1000 people each buy a single ticket to the lottery?	1/100 = X/1000	10
In the publishing sweepstake, the chances of winning a car is 1 in 1000. What percent of tickets to the publishing sweepstake wins a car?	1/1000 = X/100	0.1%

to get the right answers to these three questions, on simple probability, and converting frequency to percentages and back again. The level is that of basic and computational numeracy in Table 1.

These questions were answered by 62 first-year medical students at the University of North Carolina at Chapel Hill medical school who attended a risk-communication seminar. Most students answered all three questions correctly, but 5% (1 in 20) answered only one or none correctly (Figure 1).

Students were also given information about treatment choices, with results presented in different ways (relative risk reduction, absolute risk reduction, number needed to treat, and a combination). Most students (90%) correctly stated which drug worked better (comparative answer), but only 61% could work out the quantitative answer. For both, there was a strong relationship with being able to answer the simple maths questions correctly (Figure 2).

Numeracy in patients

The same research group performed the same tests in 257 patients aged 50 to 80 years attending for health care at an internal medicine clinic [3]. The results for numeracy are in Figure 1, and show that most patients could answer only one (30%) or no (41%) numeracy questions correctly. It was also true that whatever way information was presented to them, only 40-60% were able to determine which of two treatments was better, but fewer than 20% (1 in 5) were able to work out the quantitative difference.

Comments

There is not a huge literature on numeracy, but it is likely to be important, and at least as important as literacy. For instance, a single observational study [4] showed that patients older than 50 years attending anticoagulation management units had significantly poorer control of INR when they had low numeracy skills, while low literacy made no difference.

But numeracy and literacy have to be taken together. A detailed paper too difficult to précis [5] asked professionals and public about ways of expressing results relating to prenatal diagnosis and chromosome abnormalities. There were huge differences in the way people responded to the same information. For instance, when asked which of 5% or 1 in 20 sounded bigger, 81% thought 1 in 20 sounded bigger. That paper is certainly worth a read for anyone teaching communication skills.

The bottom line, though, is that on limited information, we can identify that many patients and some professionals have problems with numbers. That puts even more heat on trying to explain those numbers in ways that people can understand.

Figure 1: Numeracy as measured in medical students and patients

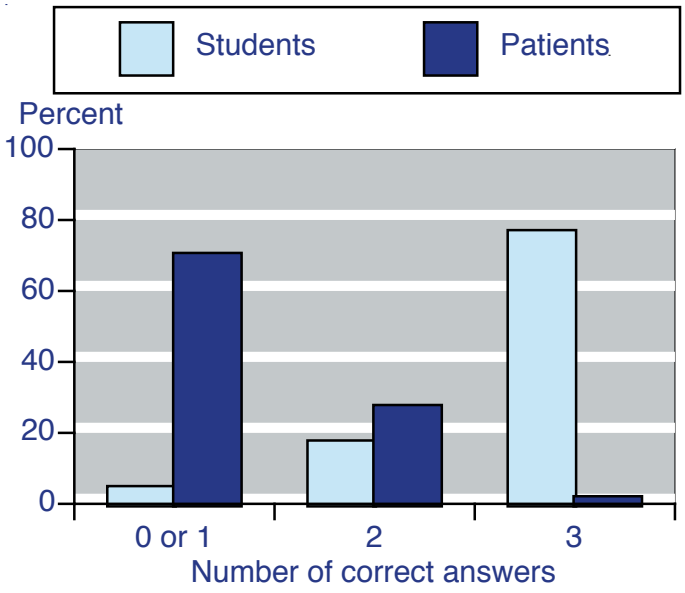
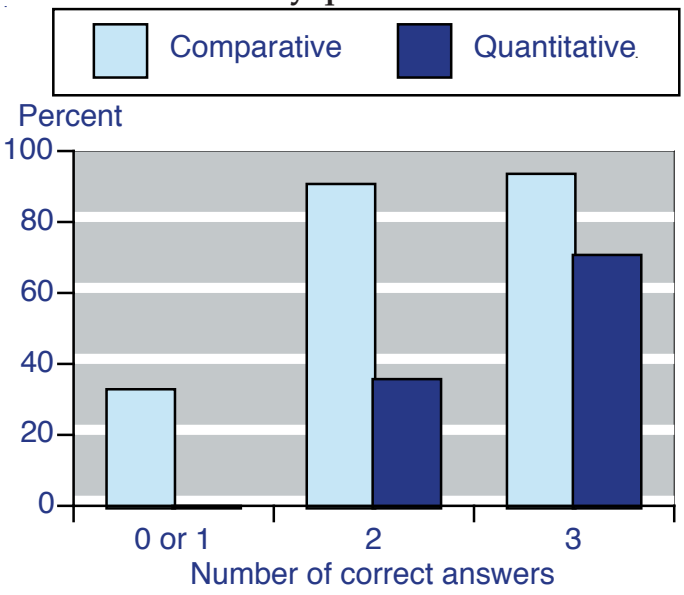


Figure 2: Students' interpretation of quantitative information according to their correct answers to numeracy questions



References:

1 AL Golbeck et al. A definition and operational framework for health numeracy. American Journal of Preventive Medicine 2005 29: 375-376.
2 SL Sheridan, M Pignone. Numeracy and the medical student's ability to interpret data. Effective Clinical Practice 2002 5: 35-40.
3 SL Sheridan et al. A randomized comparison of patients' understanding of number needed to treat and other common risk reduction formats. Journal of General Internal Medicine 2003 18: 884-892.
4 CA Estrada et al. Literacy and numeracy skills and anticoagulant control. American Journal of Medical Science 2004 328: 88-93.
5 L Abramsky, O Fletcher. Interpreting information: what is said, what is heard – a questionnaire study of health professionals and members of the public.

On risk

Bandolier has visited the issue of risk on several occasions over the years. Risk is very important, and very serious, as much as anything because communicating risk is a difficult business. We showed in Bandolier 128 how patients were unable to appreciate risk communicated to them in words and numbers, and consistently over-estimated risk, by upwards of 400 times for rare risks. A few more thoughts on risk, then.

Risk perception and presentation

A study [1] was carried out on two groups, 38 graduate students and 47 healthcare professionals. A hypothetical situation about adverse events of an influenza vaccine was presented to them in either a probability format (5%), or a frequency format (1 in 20). Randomisation was by alternation in questionnaire handouts.

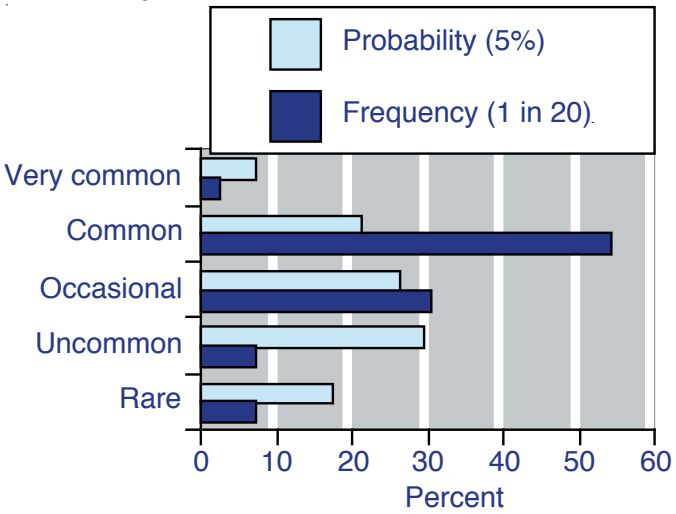
The questionnaire asked whether they would be prepared to receive a vaccine if the risk of fever and headache within seven days was either 5% (one group) or 1 in 20 (the other). A second question asked participants to match frequency with one of six phrases, from very common to very rare.

Results

There was no difference between occupation, age, or sex of the groups receiving information as probability or frequency. About 60% of participants would have elected to have the influenza vaccine, without any significant difference between a probability format (67% electing to receive it) and the frequency format (55%).

There were differences between the way in which the risk was matched to phrases (Figure 1). In both presentations, the same risk was labelled as very common, through to rare. Presentation as frequency (1 in 20) resulted in much greater consensus, with 84% happy that this could be called common or occasional, and only 9% considering it either rare or very common.

Figure 1: How graduates and professionals label the same adverse event presented in different ways



Frequency presentation

Using frequency presentations seems to make sense as a method that is intuitively sensible to most of us. Gigerenzer and Edwards [2] emphasise that frequency statements should always state a reference class (patients like us, inhabitants of Wales, people with a previous heart attack). They also give a number of examples of where patients and professionals can be misled by being given information as percentages, or those outputs of research so beloved by statisticians (relative risk, sensitivity, specificity). That which we cannot immediately understand and use is likely to be a cause of great mistakes.

John Paling [3] has come up with a series of useful ways of helping to communicate risk to patients, which is now expanded into a terrific book [4]. The article, and especially the book, are full of superb examples of various risks, and how to display them using visual presentations of natural frequencies. The book is well thought out, and comes with seven simple strategies for successful communication, and is packed with good sense. No brain ache, and lots of humour.

Examples of risk presentation

A few examples of how to present risk are always handy. Taking Gigerenzer & Edwards to heart, perhaps it is helpful to begin with some background information about risks. Table 1 therefore compiles US data from 2002 on the risk of dying, from two good websites [5,6].

Given that there is going to be a lot of lumping going on, it does give some useful ideas about what is important. For instance, it was interesting, given discussions in the UK right now about nuclear power, to discover that the number of deaths from radiation in the USA in 2002 was zero. Nor is the list necessarily fair because it is all about death, and does not reflect other issues. Chronic pain has the largest negative impact of quality of life, but because it does not kill people directly (Bandolier 83; it is a symptom, not a diagnosis), it does not figure in the list. There is more to life than death.

Table 1: Annual and lifetime risk of death from different causes in the USA in 2002

	Annual	Lifetime
Top 15 causes of death in USA in 2002	**Risk is 1 in**	
Diseases of the heart	415	5
Malignant neoplasm	516	7
Cerebrovascular disease	1786	23
Chronic lower respiratory disease	2273	29
Accidents	2703	35
Diabetes mellitus	4000	52
Influenza and pneumonia	4348	56
Alzhemier's disease	5000	65
Nephritis, nephrotic syndrome, nephrosis	7143	92
Septicaemia	8333	108
Suicide	9091	118
Chronic liver disease, cirrhosis	11111	144
Primary hypertension, hypertensive renal	14286	185
Parkinson's disease	16667	216
Pneumonitis due to solids or liquids	16667	216
Accidental causes of death in USA in 2002	**Risk is 1 in**	
Any transport accident	5953	77
Car occupant	17625	228
Air and space	440951	5704
Accidental poisoning	16407	212
Any fall	17712	229
Fall on steps or stairs	180188	2331
Fall from chair or bed	366804	4745
Accidental drowning	83534	1081
Smoke, fire, flames	91149	1179
Firearms discharge	377876	4888
Lightning	4362746	56439
Cataclysmic storm	4570496	59127

Accidents, for which a few figures out of many are given, are also interesting. It is more risky travelling by car than by air, but which gets the headlines?

Acceptable baseline risk

Actually, road traffic deaths are important. In the USA total road traffic accidents killed about 35,000 people in 2002 (compared with about 3,500 in the UK). While as a society and as individuals we strive to reduce this (breath tests, seat belts, air bags, road design), we accept it. We have to, otherwise we wouldn't travel at all. The figure of about 1 in 17,000 for death seems to be a limit of acceptability. We become uncomfortable with more likely risks.

And while we concentrate on death, we forget that for every death, there are 10 people who are seriously injured, and 77 others who have some lesser injury. So of the 60 million people in the UK, 300,000 have some injury travelling on the roads. That is 1 in 200 of us, every year; over a lifetime of 70 years, that makes the risk about 1 in 3. So at another level, travelling on the roads in the UK is an incredibly risky business. It should be banned. Back to Gigerenzer, and stressing the importance of setting.

Perspective

For some perspective on all of this, it is time to visit the Paling Perspective Scales again for some examples. Bandolier is grateful to John Paling for permission to reproduce the scales. Three examples follow:

Using information from John Paling's book, we reproduce information for the risk of a Down's syndrome baby at term according to maternal age. This is done in two ways, using the straight perspective scale with its logarithmic scale and words (Figure 2), and using the 1000-woman palette (Figure 3), showing, for each age, how many of those 1000 women might have a child affected by Down's syndrome.

Low dose aspirin has benefits and harms. The benefits include reducing heart attacks, but the harm involves gastrointestinal bleeding, which can be serious and result in death in 1 in 10 patients who suffer it. Bandolier used information from systematic reviews relating to people with a previous heart attack, and annualised the data. The 1000-person palette is used to show benefit and risk (Figure 4).

Warfarin or aspirin for patients with nonvalvular atrial fibrillation at moderate or high risk of stroke? Annualised data from a systematic review (Bandolier 108) is used on the 1000-person palette to show benefits and harms differences, in terms of heart attacks and strokes avoided with anticoagulant, but at the price of some more bleeds (Figure 5).

Comments

These pictorial representations lose something reduced in print in a single colour. On screen they look great, and should be useful tools. The problem we have though, despite our enthusiasm, is that we are all of us beginners in the business of describing risk and knowing whether different formats make a difference to how patients and professionals perceive and react to risk information. The literature is silent, or at best very, very, quiet. We need to get some good information together, prepare some presentations, and trial it.

In the meantime, suggestions for areas where these types of presentations might be helpful would be welcomed. Bandolier will try and find some data.

References:

1 SB Tan et al. Risk perception is affected by modes of risk presentations among Singaporeans. Annals Academy of Medicine of Singapore 2005 34: 184-187.
2 G Gigerenzer, A Edwards. Simple tools for understanding risks: from innumeracy to insight. BMJ 2003 327: 741-744.
3 J Paling. Strategies to help patients understand risks. BMJ 2003 327: 745-748.
4 J Paling. Helping Patients understand risks. (ISBN 0-9642236-0-0), available from riskcomm.com
5 National Vital Statistics Reports 2005 53: 15 (www.cdc.gov/nchs)
6 What are the odds of dying? National Safety Council (www.nsc.org/lrs/statinfo/odds.htm

Figure 2: Risk of Down's syndrome in a term infant for mothers of different age, using the Paling Perspective Scale

Here the risks are presented visually using a logarithmic scale, associated with verbal descriptors, and with numbers presented as natural frequencies, so that three different presentations are shown in the one graph. No contextual examples are included here, but might be in other presentations.

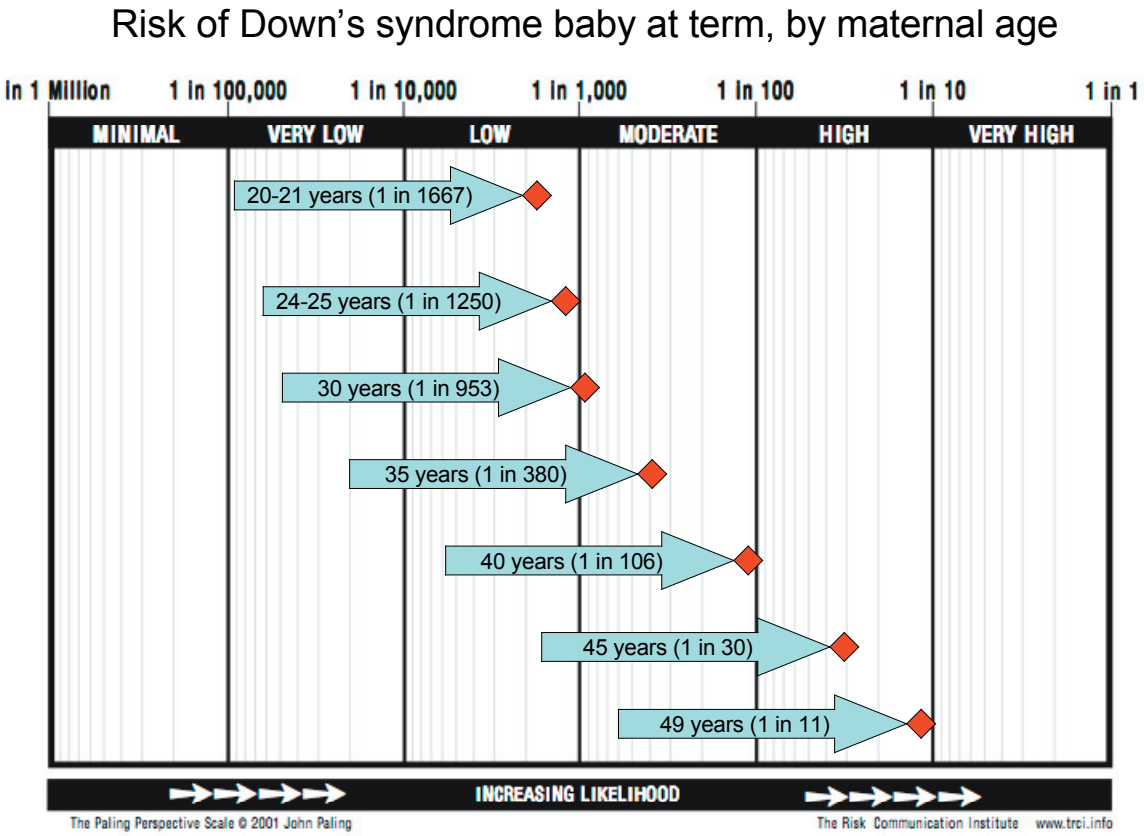
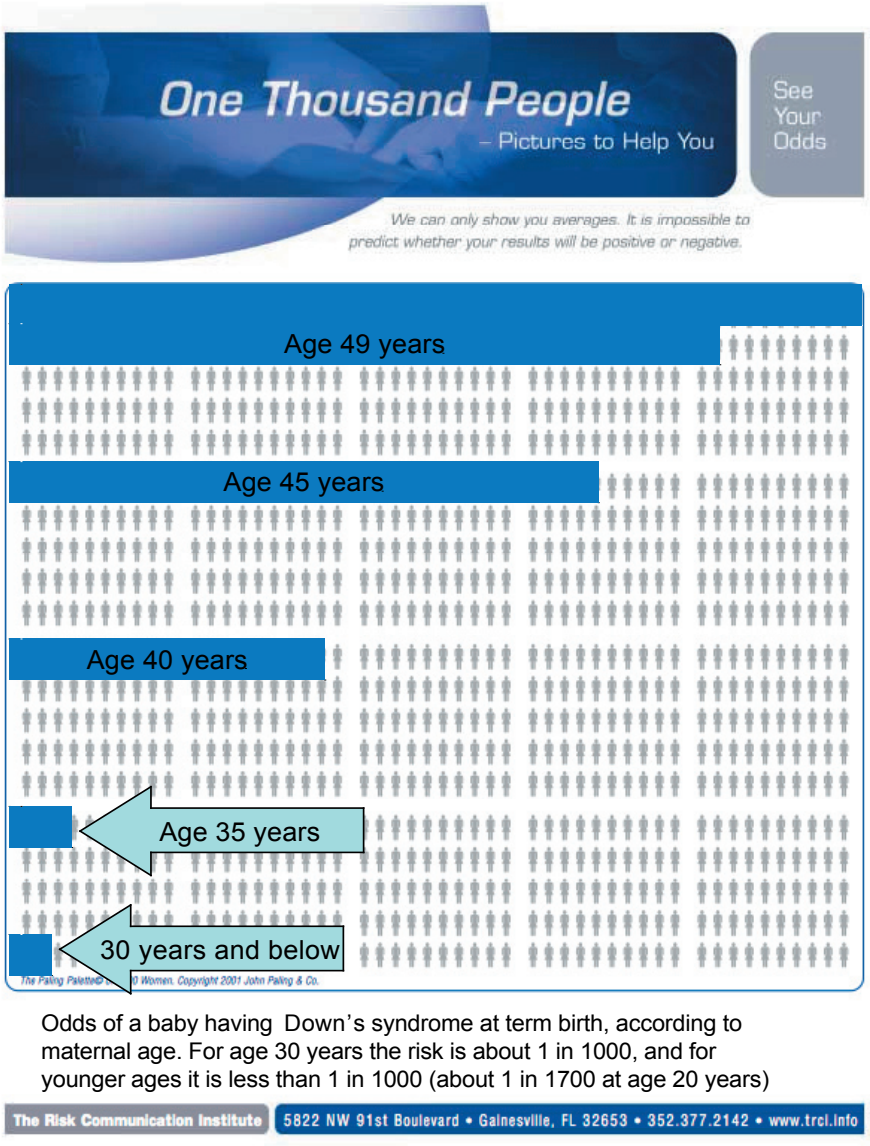


Figure 3: Risk of Down's syndrome in a term infant for mothers of different age, using the one thousand woman palette.

This example has the same information as in Figure 2, but presented differently. There are 1000 small representations of women on the palette (others are available for men or families), and the number who might be affected are coloured with a pen or highlighter.

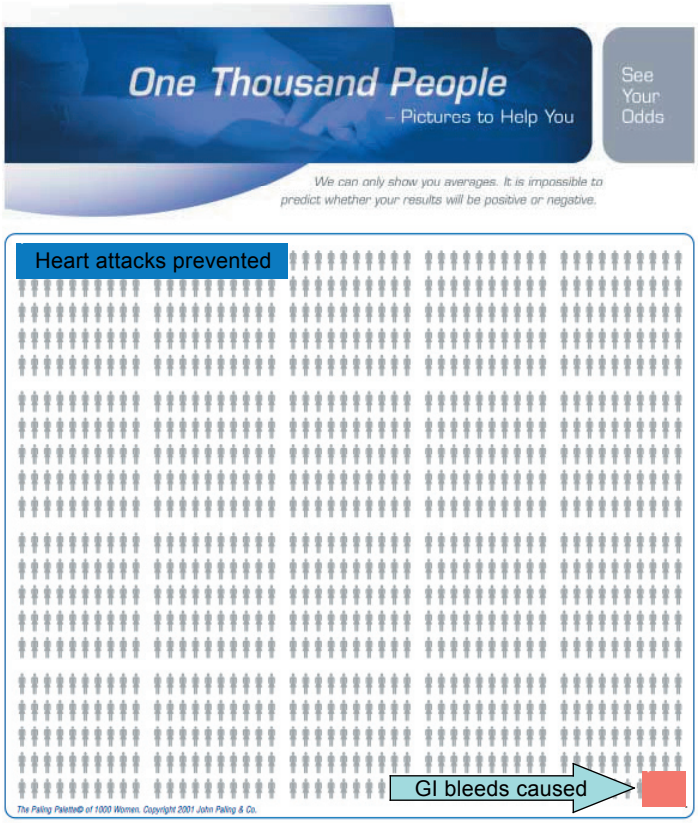
In Figure 3, as a demonstration, maternal ages are shown from 30 years and below (one woman or fewer affected), to 49 years where 91 women would be affected. Whether using all these ages, or only the one relevant for an individual is better is not known (to Bandolier, anyway), nor is it known whether this representation would be more or less acceptable than that in Figure 2.

The 1000-person palette may be useful in demonstrating the balance between benefits and harms of treatment. Figure 4 shows the example of low dose aspirin in people with a previous heart attack, and Figure 5 that of anticoagulant versus aspirin for AF in people at high risk of stroke. Benefits (heart attack or stroke avoided) and risk (bleeding events) have been annualised, and the results presented in words as well.



Odds of a baby having Down's syndrome at term birth, according to maternal age. For age 30 years the risk is about 1 in 1000, and for younger ages it is less than 1 in 1000 (about 1 in 1700 at age 20 years)

Figure 4: Low dose aspirin after a heart attack



For every 1,000 people with a previous heart attack treated with low dose aspirin for one year, there would be 20 fewer heart attacks, but 3 more gastointestinal bleeds

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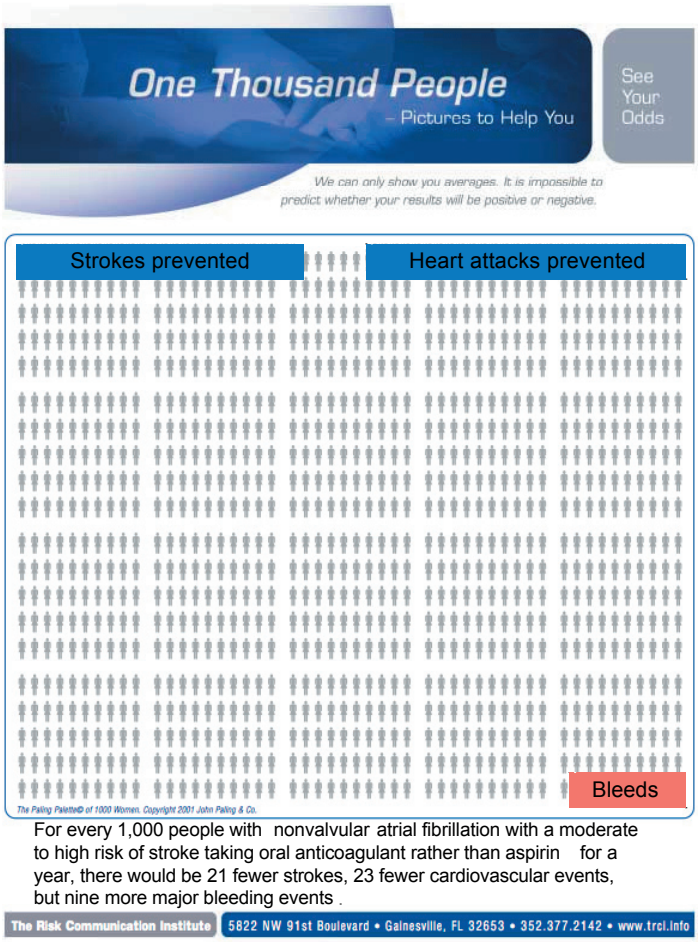
Figure 5: Anticoagulant versus aspirin for AF



For every 1,000 people with nonvalvular atrial fibrillation with a moderate to high risk of stroke taking oral anticoagulant rather than aspirin for a year, there would be 21 fewer strokes, 23 fewer cardiovascular events, but nine more major bleeding events .

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Book review

Seven strategies for helping patients understand risks

1 Prepare by first learning about the actual difficulties that patients experience in attempting to understand risks.
2 Accept the challenge that patients' emotions will invariably filter the facts and cannot be ignored.
3 Revise the way you explain probabilities to patients. The most commonly-used methods can be greatly improved with small changes.
4 Try to avoid speaking to patients in terms of relative risks. Ensure you provide context so patients get "information" and not just "data".
5 Never give the negative perspective, but, instead, make sure the positive perspective is always provided as well.
6 Explain the risk numbers by using visual aids. These give context as well as achieving understanding for the largest number of patients.
7 Realise that sharing aids with patients can serve to reinforce the doctor-patient bond, enhance trust and encourage acceptance of the doctor's message.

These are the seven key messages from John Paling's book Helping Patients Understand Risks. (ISBN 0-9642236-0-0, available from riskcomm.com; $30 + $8 postage). Paling makes the point that in industries where risks have to be communicated to the public (food, nuclear, water, chemical), there is awareness that communicating risk is difficult. There are therefore a few highly-trained people who speak for these industries.

In healthcare, where risks are much more numerous, and far more common, and certainly more complex, almost every professional communicates risk to patients, and almost none have any training at all in risk communication. Paling's book runs to 185 pages, is punctuated with pithy quotes and examples, and leads the reader though his seven steps. It is a training in risk communication.

Will it solve all the problems? Nope, because we just have not done enough work on risk communication with patients. We haven't worked up enough examples, we haven't generated different methods of explaining risks, or contexts in which to set them, or visual aids and words, and we certainly haven't tested them to know what works best in whom.

But it is time to wake up to the problem, and begin doing some serious work. Western societies, some of them anyway, have passed a tipping point. People now want to make the choices about treatment options, and those choices are different from those that might be made by doctors or healthcare providers, and especially health technology assessment. In patient-led healthcare, describing numbers to patients is the key. Buy Paling's book from the website and start the journey.

Lifestyle interventions to prevent diabetes

Bandolier readers are familiar with the associations of weight, sedentary lifestyle, and poor diet with type 2 diabetes in older adults, and increasingly with younger adults and even children. Most readers would instantly prescribe diet and exercise, but would probably not have the numbers immediately to hand to press home any arguments about whether diet and exercise worked or not. A new systematic review and meta-analysis [1] provides them.

Systematic review

The review set out to answer the question whether a lifestyle education programme compared with conventional education improved glucose levels or incidence of diabetes in people at high risk of developing type 2 diabetes. Two outcome measures were sought. The change in glucose values two hours after a 75 g oral glucose load at baseline, and more than six months later. The other outcome was diabetes incidence. Subjects had to have impaired glucose tolerance, impaired fasting glucose, or borderline values, according to standard criteria.

Trials had to be randomised, and searching was limited to English language papers published to November 2004.

Results

Nine studies were included, eight with information on plasma glucose, and five on diabetes incidence. Seven involved diet and exercise, and two diet alone; controls were generally conventional counselling or advice. Trials enrolled 80 to 3,000 subjects, with follow up from six months to six years; five larger trials had follow up of three years or longer.

The average age of patients in the trials ranged from 39 to 57 years, and the average BMI from 24 to 31 kg/sq m. Baseline two hour plasma glucose after oral load averaged 8-10 mmol/L in individual studies.

Plasma glucose

The prime end point was the difference between the two hour plasma glucose from baseline to one year or more. Results for individual studies are in Figure 1. Overall, there was a reduction in two hour plasma glucose after an oral load by 0.8 mmol/L (95% confidence interval 0.4 to 1.3 mmol/L).

Diabetes incidence

The incidence of diabetes reported in five studies lasting one to six years is shown in Figure 2. The weighted mean duration was 3.6 years. The incidence of diabetes was 28% with control (7.8%, or 1 in 13 per year), but only 15% with diet and exercise (4.2%, or 1 in 24 per year). The relative risk was 0.6 (0.5 to 0.7), and the number needed to treat was 7.4 (6.2 to 9.4) to prevent one person developing type 2 diabetes.

Comment

This is good evidence, with consistent reductions both in glucose levels and in diabetes incidence over reasonably long periods of time. The reduction of diabetes incidence by half may even understate the case. While the average duration was commendably long, at 3.6 years, continued use of a healthy lifestyle should continue to generate benefits. A 10-year NNT can be calculated at 2.6, for instance.

Put another way, if people in the studies continued to develop diabetes at the same rate, after 10 years 8 out of 10 in the control group would have developed diabetes, compared with only 4 out of 10 with the intervention. And of course, we have no information about adherence, so we only know about the effects of treatment on average. It is likely that individuals who really changed their lifestyle and stuck to it could reduce their individual risk of developing diabetes to much lower levels. The message is, yet again, that the best way of avoiding seeing your doctor, except socially, is to eat fruit and vegetables, have a good walk, and perhaps enjoy a nice glass of wine when you get back.

Reference:

1 K Yamaoka, T Tango. Efficacy of lifestyle education to prevent type 2 diabetes. A meta-analysis of randomized controlled trials. Diabetes Care 2005 28: 2780-2786.

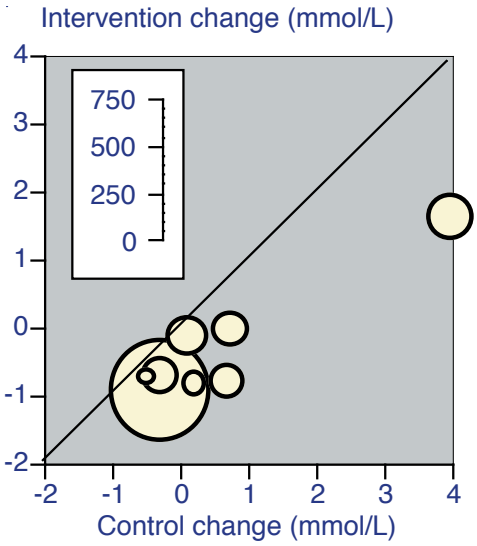

Figure 1: Change in plasma glucose at 2 hours after oral load from baseline to one year

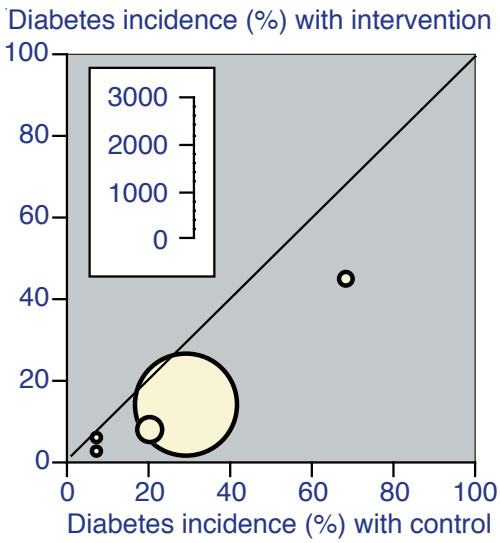

Figure 2: Incidence of diabetes over one to six years (mean 3.6 years)

Whole body vibration

Whole body vibration (WBV) refers to a machine with a flat plate on which a person stands, that stimulates the whole body by tilting slightly around an axle. The person who stands on the machine tries to keep the head and body steady and upright. All the muscles that keep the body in this position are forced to react to the oscillatory movements provided by the machine, thus exercising them. Training sessions of only 2-3 minutes twice a week are claimed to produce measurable effects.

Bandolier readers asked what the evidence was that WBV was a useful exercise, what it was good for (if anything), and who it was good for. A brief Bandolier review follows.

Search

We searched PubMed for randomised trials of WBV using a series of searches, and bibliographies. Studies were of any duration or intensity, and in any population.

Results

We found seven citations. One [1] could not be obtained. Details of reports obtained are in Table 1. Four reports appeared to be dual or duplicate reports of two trials. All the trials were small in number, and were conducted over six weeks to eight months, with a variety of results.

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One trial appeared to show benefits in pain relief for lower back pain. A second appeared to show benefits in balance, functioning, and quality of life in older women. Another trial showed improved muscle strength and bone density in postmenopausal women. The fourth trial had no important effects in young nonathletic volunteers.

Comment

None of these trials could be blinded, all were small, and they examined different regimens in different groups of people. No conclusive results could be drawn from the studies. It appears that WBV may improve balance and muscle functioning, and this may have importance in older people. Conclusive evidence of benefit for what outcome, the extent of any benefit, and in what population, remains to be proved.

Reference:
1 S Torvinen et al. Effect of a vibration exposure on muscular performance and body balance. Randomised crossover study. Clinical Physiology Functioning and Imaging 2002 22: 145-152.

Table 1: Details of randomised trials

Reference	Study design	Patients	Outcomes	Efficacy
Rittweger et al. Spine 2002 27: 1829-1834	Randomly assigned to WBV (n=30) or lumbar extension exercise (n=30) over 12 weeks, 1-2 sessions per week	Patients with lower back pain without specific underlying disease, aged 40-60 years	Primary outcomes pain sensation and pain relief, using VAS 0-100 mm	Significant decrease in pain from 40-50 mm to 10-20 mm in both groups
Torvinen et al. Medicine and Science in Sports and Exercise 2002 34: 1523-1528	Subjects randomised to vibration 4 minutes for 3-5 times a week for 12 weeks. Control appeared to be not having WBV	56 healthy nonathletic volunteers aged 19-38 years	Vertical jump, limb extension strength, grip strength, shuttle runs, postural sway	Significant improvement of 2.5 cm in vertical jump No difference for other measures
Torvinen et al. Journal of Bone and Mineral Research 2003 18: 876-884	Subjects randomised to vibration 4 minutes for 3-5 times a week for 8 months. Control appeared to be not having WBV	56 healthy nonathletic volunteers aged 19-38 years	Bone mineral density, serum markers Vertical jump, limb extension strength, grip strength, shuttle runs, postural sway	Significant benefit in vertical jump height No effect on bone or serum markers
Verschueren et al. Journal of Bone and Mineral Research 2004 19: 352-359	Subjects randomised to WBV (n=25), resistance training (n=22) or control (n=23). Training was three times a week for 24 weeks. Control had no training	70 volunteer postmenopausal women aged 58-74 years	Bone density at hip, plus isometric and dynamic strength	Vibration training improved isometric and dynamic strength (15%) and bone density (1%) Serum bone markers did not change
Roelants et al. Journal of the American Geriatric Society 2004 52: 901-908	Subjects randomised to WBV (n=30), resistance training (n=30), or control without training (n=29). Training was three times a week for 24 weeks. Control had no training	69 volunteer postmenopausal women, average age 64 years	Bone density at hip, plus isometric and dynamic strength	Vibration training improved isometric and dynamic strength (15%) and other markers of muscle function
Bruyere et al. Archives of Physical medicine and Rehabilitation 2005 86: 303-307	Subjects randomised to six weeks of WBV plus physical therapy (n=22) or physical therapy alone (n=20). Training was three times a week	42 older female volunteers in nursing homes Age 63 to 98 years, average age 82 years	Balance, timed tests of mobility, SF-36	In the WBV group: Balance scores improved significantly, and a test associated with falls improved above a threshold associated with increased risk of falling Timed tests improved significantly SF-36 improved in 8 of 9 domains